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a. The research and development projects worked on by the TROMMSDORF group comprised the following. (The E, C and A series of projects described below cover projectiles which had actually been fired by the Germans or for which there

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was ground to suppose that the Soviets had carried out firing trials. In addition, the group spent a certain amount of time on the projects known as B, D and F, but [] these never went beyond the paper stage.)

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E Series

This series consisted of athodyd-assisted shells designed solely to test the theory of this method of propulsion. About 60 shells were fired, each having an all-up weight of about 40 kg. 15 cm. caliber, muzzle velocity 900m/sec., maximum velocity 1400 m/sec. [] For further details see answer to question 6. [] It should be pointed out that about an equal number of this type of shell had already been fired in Germany. The Putilovo experiments were purely a repetition of this work.

C Series

These were athodyd-assisted shells of heavy caliber (28 cm.) with a theoretical range of about 300 km., muzzle velocity 1100 m/sec. maximum velocity 1600 m/sec. The shells had been originally designed for the German K5 gun, of which at least two specimens fell into Soviet hands at the end of the war. These projectiles were similar in design to the E Series but had never been fired in Germany. A complete set of drawings were made by the TROMMSDORF group utilizing old German data; 50 of these shells were manufactured at Putilovo. [] Germans ever saw any of these projectiles fired, [] the Soviets carried out tests. The project was discussed by them up to 1952, []

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A Series

This series consisted of fin-stabilized athodyd-powered projectiles, started by powder rockets from launching rails or ramps. Paper projects covered a series of projectiles with an all-up weight ranging from 20 to 200 kg., and expected ranges from 50 to 150 km. Only one design, the largest of this series, having 45 cm. caliber, was actually built. (Over 20 of these shells were made at Putilovo between 1949 and 1950. The code name was A4.) None of the Germans ever saw any of these projectiles fired either. [] a conversation with METRIKHAS that Soviet trials had been successful, and that a range of 120 km. had been achieved. (Although the shell was designed for a useful load or warhead of 100 kg., []

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[] It should also be remembered that these shells had never been fired in Germany.)

B Series

These constituted rocket-launched, athodyd-assisted, fin-stabilized projectiles similar to the A series already mentioned. The main difference lies in the fact that while the A series used a launching rail or ramp, the B series would be launched from a smooth, closed tube of considerable length. The rocket exhaust built up pressure in the launching tube and the projectile is accelerated partly by gas pressure and partly by rocket reaction. [] discussed the project in detail with METRIKHAZ, and sketch drawings of a 1000 kg. projectile with 300 km. range, including the proposed launching tube were prepared for the Soviets, [] not think that the project was taken up by them.

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D Series

This project existed only on paper. It consisted of a winged projectile of 1000 kg. total weight, athodyd-propelled to fly at 24 km. and a Mach No. of 3.5; the estimated range was 6000 km. [] no knowledge of what the Soviet reaction was to this,

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F Series

This series consisted of athodyd-assisted antiaircraft projectiles (flak) of all kinds. It was one of the last development tasks of the group and was not developed beyond the preliminary stages. [] sufficient experience has been gained by now to render possible the design of anti-aircraft projectiles with a muzzle velocity of 900 m/sec., a maximum velocity of 1500 m/sec., and operating at altitudes up to 40 km. The effect of density on stability of operation of the athodyd would not [] present an insoluble problem.

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- b. [] no [] facilities capable of testing ram-jet engines in the USSR apart from the model installation [] This consisted of a 10 x 10 cm. supersonic tunnel in which the efficiency of the diffuser utilized in the E series of projectile could be tested. The tunnel was of the two-dimensional intermittent type with four to six seconds running time. The cycle started with compressed air at 100 atmospheres, which was expanded through a quick-release valve into a heat exchanger where it was heated to about 500° C; the pressure and temperature at this point were closely controlled. The air then expanded to atmospheric pressure through a laval nozzle, passing the actual working section of the tunnel at approximately normal atmospheric pressure and temperature. Thrust or drag could be measured by means of an inductor type of dynamometer, and a simple form of Schlieren apparatus was also provided. In addition to the diffuser experiments, actual burning tests were carried out in the tunnel with model combustion chambers of different designs. As a corollary, a large tube was set up fitted with observation windows. Air at 30 atmospheres and 500° C was admitted at one end of the tube, fuel being injected through a nozzle let into the wall. The distances along the tube to the first appearance of flame and to the point at which combustion was 80 per cent complete were measured and thus burning time computed. Over 2000 separate combustion tests of this nature were carried out in the USSR. [] For details see [] 5.7

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- c. [] The supersonic tunnel, however, created great interest and was inspected by groups of Soviets who appeared to be wind tunnel specialists and who, [] came from TSAGI (Moscow).

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- d. Soviet personnel who were associated with ram-jet development at Putilovo were:

(1) DAVICHEV

Chief of Putilovo Institute. A good development engineer. He spoke fluent English and had been abroad [] for several years. He was formerly attached to GEMA.

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(2) ULIANOV

Deputy to DAVICHEV. Regarded as stupid by the Germans.

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- (3) GORSKI, Capt, Worked on the range at Putilovo. A good scientist; he specialized in thermodynamics. Formerly attached to Institute Berlin.
- (4) IVANOV, Col. Head of the firing range at Putilovo.
- (5) METRIKHAS One of the best engineers at Putilovo. A specialist in powder rockets. Served in the Soviet Air Force during the war. 50X1-HUM
- (6) SUDAKOV Attached to the Ministry of Agricultural Machinery. Administrative chief of the TROMMSDORF group at Putilovo. He had some knowledge of powder rockets, but no original ideas. 50X1-HUM

[redacted] aspects of [redacted] missile propulsion work with GORSKI and METRIKHAS. [redacted] their technical qualifications to be first-class, judging them by Western standards. [redacted] 50X1-HUM

2.

[redacted]

[redacted] the mere indication of apparent dis- 50X1-HUM
interest is a possible indication that athodyds are being con-
sidered seriously by the Soviets as a part of a missile propulsion
system. The last flight tests [redacted] took place late 50X1-HUM
in 1949. [redacted] no
access to the firing range after 1950. However, [redacted]
athodyds fired after that date although the Soviets denied
this.

3.

[redacted]

4.

[redacted]

5.

[redacted]

[redacted] no [redacted] Soviet developments in the design of burners and combustion chambers. The work carried out [redacted] was merely a repetition of work previously carried out in Germany. Injection nozzles were made of copper and not larger than .3 mm. in diameter. Injection pressure has to be such that the drops

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